

Bogue Inlet Channel Erosion Response Project Draft Environmental Impact Statement

Cumulative Effects. Dredging in the offshore borrow areas is limited to a maximum depth of cut of 4 feet. This rather shallow cut should result in the rapid recovery of the area, however, the recovery time could still take 1 to 2 years. This could impact food sources used by turtles.

Compatibility with Project Objectives. Offshore sea turtle resources are outside the scope of the project objectives.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Alternative F would avoid the disturbance of 141.5 acres of offshore turtle habitat. Construction activities will be restricted to the middle of Bogue Inlet and along western Emerald Isle. Therefore, impacts to offshore sea turtle habitats are not expected from dredging activities.

Cumulative Effects. No cumulative impacts are predicted to occur from the channel relocation with beach nourishment alternative.

Compatibility with Project Objectives. Although offshore sea turtle resources are outside the scope of the project objectives, the use of the inlet material for beach nourishment would preserve offshore sea turtle habitat.

5.7 RESIDENT AND MIGRATORY BIRD RESOURCES

5.7.1 Shorebirds

Alternatives A, B, and C would have the same impacts on shorebirds as described below.

Direct and Indirect Impacts. Erosion of the Emerald Isle Inlet shoreline, including the sand spit north of the Pointe subdivision and southern Dudley Island could potentially result in the loss of foraging, roosting, and nesting habitat. However, inlets are typically dynamic environments that are subjected to a continual state of change to which shorebirds can readily adapt. Erosion in one section of Emerald Isle is offset by accretion in other areas and birds will move within the inlet complex in response to these changes. For example, with the erosion on the western end of Emerald Isle, there is also accretion on the beach east of the sandbags and the development of the large spit at The Point. Therefore, the continuation of the inlet shoreline erosion associated with Alternatives A, B, and C should not result in any significant impact on shorebirds.

Nourishment of Phase 3 of the permitted Emerald Isle beach nourishment project

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would be accomplished using offshore borrow areas which may introduce less compatible material to the ocean shoreline. Erosion of the eastern 7,500 feet of Bear Island will also continue resulting in the loss of shorebird habitat on this island.

Cumulative Effects. If erosion of the inlet shoreline continues over a period of 10 years, the character of the inlet shoreline is predicted to change with the loss of upland areas in the Pointe subdivision, erosion of ocean beach resources along the west end of Emerald Isle, and the possible evolution of the Emerald Isle sand spit to an overwash terrace. Since these changes occur in most natural inlet systems, they should not have a significant impact on shorebirds or shorebird habitat. Erosion of the east end of Bear Island could also result in the loss of shorebird habitat.

Compatibility with Project Objectives. Alternatives A, B, and C do not address the project objectives, however, there would not be any significant negative impacts on shorebirds.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. The realignment of the channel to a central location may remove some of the inlet shorebird's prey base from the intertidal flats and shoals of the inlet. The stockpiling of the channel material on the Emerald Isle sand spit will temporarily disturb foraging, resting, and loafing areas. However, it has been shown that infauna should recruit and repopulate from undisturbed areas quickly. Construction of the sand dike and filling of the existing channel will immediately replace a portion of the lost resting and loafing habitat used by shorebirds, and this area will be available for foraging activities once benthic infaunal populations have recolonized the area. In addition, construction activities and noise associated with these activities may disturb shorebirds by causing them to spend more time being alert than foraging and resting.

Shoreline adjustments that would accompany the relocation of the inlet channel will result in erosion along the western 7,500 feet of Emerald Isle and accretion along the eastern 7,500 feet of Bear Island. The erosive impacts of relocating the channel on the west end of Emerald Isle would be partially offset by the inclusion of the eastern 3,000 feet of the shoreline impact in the Phase 3 beach nourishment project and the continued disposal of navigation maintenance material on the extreme west end of Emerald Isle. The predicted shoreline adjustments should result in no net change in shorebird habitat.

The restoration of the inlet shoreline that is predicted to occur due to the filling of the existing channel and the formation of the sand spit off the west end of Emerald Isle would reestablish public access to the inlet shoreline to a condition that existed

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in the past. An increase in pedestrian and vehicular access to the inlet shoreline, particularly during nesting season, could negatively impact shorebirds.

Cumulative Effects. Sand dike construction and the filling of the existing channel are predicted to lead to the formation of intertidal habitat. The newly established habitat can be used by shorebirds for foraging, nesting, and roosting. Once the sand dike has been constructed and the existing channel filled, access to isolated inlet shorebird habitats will be established which could increase the potential for predator and human affects to inlet shorebird resources.

Erosion of the western 7,500 feet of Emerald Isle will occur over at least a 10-year period which will impact shorebird resources in this area. This erosive impact will be partially offset by the construction of Phase 3 of the permitted Emerald Isle beach nourishment project which will include the eastern 3,000 feet of the shoreline impact area. Accretion of the 7,500 feet of shoreline on the east end of Bear Island over a similar 10-year period would provide additional shorebird habitat.

Compatibility with Project Objectives. The channel relocation without beach nourishment alternative supports all of the objectives of the project except the provision of quality beach nourishment material for Phase 3 of the permitted Emerald Isle beach nourishment project.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Intertidal sand flats are typically found in Bogue Inlet and are commonly used by shorebirds. These shoals are part of a dynamic system that shorebirds have adapted their behaviors to use. The realignment of the channel to a central location may remove some of the inlet shorebird's prey base from the intertidal flats and shoals of the inlet. However, it has been shown that infauna should recruit and repopulate from undisturbed areas quickly. Construction of the sand dike will immediately replace a portion of the lost resting and loafing habitat used by shorebirds, and this area will be available for foraging activities once benthic infaunal populations have recolonized the area. In addition, construction activities and noise associated with these activities may disturb shorebirds by causing them to spend more time being alert than foraging and resting.

Erosion of the western 7,500 feet of Emerald Isle will occur over at least a 10-year period which will impact shorebird resources in this area. This erosive impact will be partially offset by the construction of Phase 3 of the permitted Emerald Isle beach nourishment project which will include the eastern 3,000 feet of the shoreline impact area. Accretion of the 7,500 feet of shoreline on the east end of Bear Island over a similar 10-year period would provide additional shorebird habitat.

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The restoration of the inlet shoreline that is predicted to occur due to the filling of the construction of the sand dike and the formation of the sand spit off the west end of Emerald Isle would reestablish public access to the inlet shoreline to a condition that existed in the past. An increase in pedestrian and vehicular access to the inlet shoreline, particularly during nesting season, could negatively impact shorebirds.

Cumulative Effects. Sand dike construction is predicted to lead to the formation of intertidal habitat as the existing channel fills in and equilibration occurs. The newly established habitat can be used by shorebirds for foraging, nesting, and roosting. Once the sand dike has been constructed, access to isolated inlet shorebird habitats will be established which could increase the potential for predator and human affects to inlet shorebird resources.

The beach habitat created from the immediate beach nourishment should provide additional habitat for shorebirds and thus, positive cumulative impacts may result. Furthermore, the expected accretion along Bear Island should also provide additional habitat for shorebird resources, however, gains on Bear Island would be offset by similar losses on the west end of Emerald Isle. Some of the predicted shoreline losses on the west end of Emerald Isle would be offset by the inclusion of the eastern 3,000 feet of the shoreline impact area in the Phase 3 beach nourishment project.

Compatibility with Project Objectives. The channel relocation without beach nourishment alternative supports the objectives of the project.

5.7.2 Colonial Waterbirds

Alternatives A, B, and C are expected to have the same impact on colonial waterbirds as described below.

Direct and Indirect Impacts. Colonial waterbirds are known to congregate and forage in areas of western Emerald Isle and throughout the permit area. Under Alternatives A, B, and C, the inlet areas is expected to continue to evolve with the loss of some areas, such as the existing Emerald Isle sand spit, that would be replace by the natural formation of other upland or supratidal areas within the inlet complex. Ocean shoreline habitat will also likely be lost to erosion, however, colonial waterbirds should be able to adapt to these changing conditions and utilize alternative sites. For example, colonial waterbirds can easily move to marsh habitats which surround Bogue Inlet, and are commonly used by foraging waterbirds. As a result, no direct or indirect negative impacts on colonial waterbirds are expected from Alternatives A, B, and C.

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Cumulative Effects. The continued evolution of the inlet environment expected to accompany Alternatives A, B, and C and the erosion of Bear Island are not expected to have any negative cumulative impacts on colonial waterbirds

Compatibility with Project Objectives. Alternatives A, B, and C do not address most of the stated project objectives.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. Colonial waterbirds are known to congregate in large colonies on the intertidal flats of Bogue Inlet, including Islands Nos. 1 and 2. With the relocation of the channel to a central location, loss of intertidal flat resources will occur. For example, Island No.1, which is a marginal ebb channel shoal, will likely disappear from its present location but be reformed adjacent to the relocated channel. The shoal system of Bogue Inlet is dynamic and the loss and reformation of sand flats is a common occurrence. Temporary direct impacts to colonial waterbirds may result from disturbance to individuals during construction activities which may result in the waterbirds spending more time being alert than foraging.

Most colonial waterbirds feed mainly on finfish and not on benthic infauna as shorebirds do. Temporary and minimal impacts to finfish are expected with the loss of infaunal prey of finfish being restricted to the immediate channel area and dike construction. With decreases in finfish being localized in the channel and dike construction areas, colonial waterbirds can easily move to other suitable areas around Bogue Inlet, such as marsh habitats, to forage.

Stockpiling of the 809,500 cubic yards of material on the Emerald Isle sand spit may have direct and indirect impacts to colonial waterbirds by burying roosting habitat and smothering the infaunal community which is fed upon by finfish (most colonial waterbird's prey). The removal of the stockpiled material and deposition of the material in the existing channel will then create nesting and roosting habitat for colonial waterbirds and return finfish numbers to normal levels as benthic infauna quickly move in from adjacent areas.

The west end of Emerald Isle is expected to erode in response to the new channel location, however, these negative impacts on colonial waterbirds should be offset by accretion on the east end of Bear Island.

Cumulative Effects. Construction of the sand dike and the filling of the existing channel with the stockpiled material should result in the rapid transition of these areas to subtidal, intertidal, or supratidal habitats which will provide suitable nesting, roosting, and foraging habitat for colonial waterbirds. The restoration of the inlet shoreline that is predicted to occur due to the filling of the existing channel and the formation of the sand spit off the west end of Emerald Isle would

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reestablish public access to the inlet shoreline to a condition that existed in the past. An increase in pedestrian and vehicular access to the inlet shoreline, particularly during nesting season, could negatively impact colonial waterbirds.

The erosion of the west end of Emerald Isle and accretion on the east end of Bear Island will tend to have offsetting impacts on colonial waterbirds. The predicted erosion on the western 7,500 feet of Emerald Isle will eventually be partially offset by the inclusion of the eastern 3,000 feet of the shoreline impact area in the Phase 3 beach nourishment project.

Compatibility with Project Objectives. The channel relocation without beach nourishment alternative satisfies all project objectives as they related to inlet resources and the protection of upland properties. With this alternative, the Town of Emerald Isle will still be required to finance and implement the Phase 3 beach nourishment project using an offshore sand source.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Colonial waterbirds are known to congregate in large colonies on the intertidal flats of Bogue Inlet, including Islands Nos. 1 and 2. With the relocation of the channel to a central location, loss of intertidal flat resources will occur. For example, Island No.1, which is a marginal ebb channel shoal, will likely disappear from its present location but be reformed adjacent to the relocated channel. The shoal system of Bogue Inlet is dynamic and the loss and reformation of sand flats is a common occurrence. Temporary direct impacts to colonial waterbirds may result from disturbance to individuals during construction activities which may result in the waterbirds spending more time being alert than foraging.

Other impacts may come from a decrease in finfish numbers as a loss of benthic infauna from the intertidal flats may result due to the relocation of the sand from and intertidal / subtidal location to subtidal / supratidal condition at the sand dike. Long-term effects to benthic infaunal prey species is not expected to result from project construction as these species have been shown to repopulate disturbed habitats quickly, and thus, long-term effects to colonial waterbird prey (finfish) species is expected to be short-term.

The erosion of the west end of Emerald Isle and accretion on the east end of Bear Island will tend to have offsetting impacts on colonial waterbirds. The predicted erosion on the western 7,500 feet of Emerald Isle will be partially offset by the inclusion of the eastern 3,000 feet of the shoreline impact area in the Phase 3 beach nourishment project.

Cumulative Effects. Construction of the sand dike is predicted to result in the equilibration and filling of the abandoned channel and transition of the subtidal

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resources to intertidal or supratidal habitats depending upon location which will provide additional habitat for inlet colonial waterbirds. In addition, the dynamic shoal system will likely reform sand flats that waterbirds can use for foraging, nesting, and related activities which should result in positive cumulative impacts for colonial waterbirds.

The restoration of the inlet shoreline that is predicted to occur due to the filling of the existing channel and the formation of the sand spit off the west end of Emerald Isle would reestablish public access to the inlet shoreline to a condition that existed in the past. An increase in pedestrian and vehicular access to the inlet shoreline, particularly during nesting season, could negatively impact colonial waterbirds.

Compatibility with Project Objectives. This alternative is compatible with all of the project objectives.

5.7.3 Other Waterbirds

Alternatives A, B, and C are expected to have the same impact on other waterbirds as described below.

Direct and Indirect Impacts. Inlet habitats, such as western Emerald Isle are utilized by other species of waterbirds, such as loons, mergansers, and ospreys, as foraging and roosting grounds. Under Alternatives A, B, and C, the inlet areas is expected to continue to evolve with the loss of some areas, such as the existing Emerald Isle sand spit, that would be replaced by the natural formation of other upland or supratidal areas within the inlet complex. Alternatives A, B, and C will likely cause the loss of potential roosting and foraging habitat on west end of Emerald Isle as inlet shoreline continues to migrate to the east. Losses of habitat will also continue to occur with erosion of the east end of Bear Island. Most of these species have adapted to using a variety of inlet ocean habitats and should find acceptable alternative sites. Many species considered as other waterbirds, such as rails, will utilize marsh habitat around the Inlet. As a result, no direct or indirect negative impacts on other waterbirds are expected from Alternatives A, B, and C.

Cumulative Effects. The continued evolution of the inlet environment expected to accompany Alternatives A, B, and C are not expected to have any negative cumulative impacts on other waterbirds.

Compatibility with Project Objectives. Alternatives A, B, and C do not support the project objectives.

Alternative E – Channel Relocation without Beach Nourishment

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Direct and Indirect Impacts. The realignment of the channel to a central location may decrease the levels of other waterbird's prey base (finfish) from areas near the intertidal flats and shoals of the inlet due to the possibly removal of benthic infauna in which finfish forage on. However, it has been shown that infauna should recruit and repopulate from undisturbed areas quickly and thus, decrease in finfish levels should be short-term. Construction of the sand dike and filling of the existing channel will immediately replace a portion of the lost resting and loafing habitat used by waterbirds, and this area will be available for foraging activities once benthic infaunal populations (and finfish) have recolonized the area. In addition, construction equipment and activities may disturb waterbirds by causing them to spend more time being alert than foraging and resting. However, other areas around Bogue Inlet, away from direct influences of construction activities, are preferred by other waterbirds. For example, other waterbirds, such as rails, prefer marsh habitats as foraging and roosting grounds as these areas can provide significant amounts of prey resources to keep direct and indirect impacts to other waterbirds temporary and minimal.

Stockpiling of the 809,500 cubic yards of material on the Emerald Isle sand spit may have direct and indirect impacts to other waterbirds by burying habitat used in foraging, nesting, and roosting activities and smothering the benthic infauna that are fed on by finfish (colonial waterbirds prey). The removal of the stockpiled material and deposition of the material in the existing channel will create foraging, nesting, and roosting habitat after the areas are quickly colonized by finfish as benthic infauna move in from adjacent areas.

The use of offshore borrow material to construct the Phase 3 beach fill should not have a significant impact on other waterbirds.

Cumulative Effects. Sand dike construction and the filling of the existing channel with the stockpiled material are predicted to lead to the formation of intertidal habitat. The newly established habitat can be used by other waterbirds for foraging, nesting, and roosting. Once the sand dike has been constructed and the existing channel filled, access to the isolated inlet shorebird habitats will be established which could increase the potential for predator and human affects to inlet shorebird resources.

Compatibility with Project Objectives. The channel relocation without beach nourishment alternative supports the objectives of the project.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Intertidal sand flats are typically found in Bogue Inlet and are commonly used by other waterbirds. These shoals are part of a dynamic system that waterbirds have adapted their behaviors to use. The realignment of

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the channel to a central location may decrease the levels of other waterbird's prey base (finfish) from areas near the intertidal flats and shoals of the inlet due to the possibly removal of benthic infauna in which finfish forage on. However, it has been shown that infauna should recruit and repopulate from undisturbed areas quickly and thus, decrease in finfish levels should be short-term. Construction of the sand dike will immediately replace a portion of the lost resting and loafing habitat used by other waterbirds, and this area will be available for foraging activities once benthic infaunal populations (and finfish) have recolonized the area. In addition, construction equipment and activities may disturb shorebirds by causing them to spend more time being alert than foraging and resting. However, other areas around Bogue Inlet, away from direct influences of construction activities, are preferred by other waterbirds. For example, other waterbirds, such as rails, prefer marsh habitats as foraging and roosting grounds as these areas can provide significant amounts of prey resources to keep direct and indirect impacts to other waterbirds temporary and minimal.

Cumulative Effects. Sand dike construction is predicted to lead to the formation of intertidal habitat as the existing channel fills in and equilibration occurs. The newly established habitat can be used by waterbirds for foraging and roosting activities. Once the sand dike has been constructed, access to the isolated inlet shorebird habitats will be established which could increase the potential for predator and human affects to inlet shorebird resources.

While the inlet material is more compatible than the material contained in offshore borrow areas, the use of the inlet material to construct the Phase 3 beach fill should have the same impacts on colonial waterbirds as the offshore material.

Compatibility with Project Objectives. The channel relocation without beach nourishment alternative supports the objectives of the project.

5.8 WATER QUALITY

5.8.1 Turbidity

Alternatives A, B, and C will have similar impacts on turbidity as described below.

Direct and Indirect Impacts. The USACE Navigation Branch would continue to maintain the Bogue Inlet navigation channel using sidecast dredges. Maintenance dredging in Bogue Inlet is normally carried out during 3 to 4 week periods separated by several months. The inlet material is composed of medium to fine grained quartz sand with minimal shell and silt content. As a result of the time separation between operations and the quality of the dredged material, the impacts of each maintenance operations on turbidity appear to be minimal.

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The Town of Emerald Isle will proceed with construction of the Phase 3 beach nourishment project using sand from an offshore borrow site. Selection of an appropriate offshore borrow area with a low silt/clay component is important to assure that turbidity levels are in compliance with the State of North Carolina water quality standards. In this regard, sampling of the offshore borrow material used to construct Phases 1 and 2 of the Bogue Banks beach nourishment project indicated that the sediment only contained 0.5 % silt. As a result, beach nourishment with the offshore borrow material will result in minimal and temporary increases in turbidity at the offshore borrow and shoreline fill sites. Increases in turbidity associated with beach nourishment projects is known to dissipate to ambient conditions within one to two tidal cycles following cessation of the activity in a particular area.

Cumulative Effects. Due to the low silt/clay content of the material dredged during channel maintenance operations cumulative impacts due to high levels of turbidity are not expected to occur from Alternatives A, B, and C. Similarly, construction of the beach fill using offshore sand sources will not result in adverse cumulative effects to water quality.

Compatibility with Project Objectives. Alternatives A, B, and C do not support the project objectives to protect the Emerald Isle inlet shoreline properties from erosion or provide for the nourishment of the Phase 3 using a high quality sand source.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. Excavation of the new channel and construction of the sand dike across the existing channel are expected to result in temporary increases in suspended sediment and turbidity in the immediate area of construction activity. Computations of the suspended sediment plume associated with the dike construction found that suspended sediment concentrations of 6 ppm could occur between the dike and the confluence of the inlet channel with Eastern Channel. Similarly, suspended sediment concentration seaward of the dike would be around 4 ppm between the dike and the seaward limit of the existing inlet channel. While there is no direct correlation between suspended sediment and turbidity, the low suspended sediment concentration combined with the low silt content of the inlet material (1.25%) resulted in the conclusion that turbidity should remain below the state standard outside the immediate construction or disposal area (see Appendix B). Any increase in turbidity associated with the excavation of the channel, stockpiling of material on the Emerald Isle sand spit, construction of the sand dike, or the mechanical transfer of the stockpiled material to the existing channel should be of short duration.

The Town of Emerald Isle will proceed with construction of the Phase 3 beach nourishment project using sand from an offshore borrow site. Selection of an

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appropriate offshore borrow area with a low silt/clay component is important to assure that turbidity levels are in compliance with the State of North Carolina water quality standards. In this regard, sampling of the offshore borrow material used to construct Phases 1 and 2 of the Bogue Banks beach nourishment project indicated that the sediment only contained 0.5 % silt. As a result, beach nourishment with the offshore borrow material will result in minimal and temporary increases in turbidity at the offshore borrow and shoreline fill sites. Increases in turbidity associated with beach nourishment projects is known to dissipate to ambient conditions within one to two tidal cycles following cessation of the activity in a particular area.

Cumulative Effects. No cumulative effects are expected to result from project implementation since turbidity levels will not exceed the state standard and suspension time is expected to be minimal.

Compatibility with Project Objectives. Alternative E satisfies all of the project objectives except the use of high quality fill material for Phase 3.
Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Construction of the sand dike across the existing channel will result in the suspension of the silt and clay material with this material being transported toward the sound and the ocean during the flood and ebb phases of the tide respectively. The low silt/clay content of the inlet material will result in relatively low concentrations of suspended sediment outside the immediate area deposition. Estimates of the travel distance and concentrations of suspended sediment during the dike construction (see Figure 6.1 in Appendix B) found that suspended sediment should average around 6 parts per million (ppm) from the dike area to the confluence of the inlet channel with the Eastern Channel and average 4 ppm seaward of the dike. While there is no direct correlation between suspended sediment concentrations and turbidity, the low concentration of suspended sediment indicates that turbidities are likely to remain low during dike construction.

Cumulative Effects. No cumulative impacts on turbidity are expected due to the low suspended sediment concentrations and low silt content of the inlet material. Any increases in turbidity would be limited to the immediate construction area and would be of relatively short duration.

Compatibility with Project Objectives. This alternative supports the project objectives.

5.8.2 Salinity

Alternatives A, B, and C are expected to have the same impacts on salinity as described below.

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Direct and Indirect Impacts. Maintenance dredging of the Bogue Inlet channel conducted by the USACE Navigation Branch is not expected to change salinity levels in the area since this activity does not change the hydrodynamics of the inlet.

Cumulative Effects. No cumulative effects on salinity are expected to result from Alternatives A, B, and C.

Compatibility with Project Objectives. Alternatives A, B, and C do not address any of the project objectives.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. During the year, Bogue Inlet has natural fluctuations in salinity ranging from high, transitional, to low depending on tide conditions and antecedent rainfall/runoff conditions. The dimensions of the new channel were selected based on the ability of the new channel to capture the majority of the tidal flow through Bogue Inlet. The minimum cross-sectional area of Bogue Inlet would be slightly less than its historic equilibrium size immediately following construction of the new channel and closure of the existing channel. Within a relatively short period, perhaps 4 to 6 weeks, the cross-sectional area of the inlet will expand to accommodate the normal tidal prism of the inlet. Resumption of the normal tidal exchange will maintain salinity levels in the inlet environment to natural levels. Therefore, no permanent changes in salinity above natural fluctuations are expected to occur from the channel relocation without beach nourishment alternative.

Cumulative Effects. Salinity levels are not anticipated to change as a result of this project and therefore, no cumulative impacts are expected to occur.

Compatibility with Project Objectives. This alternative does not adversely affect salinity in the project area and is therefore, compatible with the project alternatives that address shoreline protection for the Town's western boundary. Use of an offshore borrow site to obtain material for the Phase 3 beach project will not affect salinity in the area.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. During the year, Bogue Inlet has natural fluctuations in salinity ranging from high, transitional, to low depending on tide conditions and antecedent rainfall/runoff conditions. As with Alternative E, the cross-sectional area of Bogue Inlet will be slightly smaller than its equilibrium size immediately following construction but is expected to rapidly expand and assume its natural

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cross-sectional area within 4 to 6 weeks after construction with a return of the normal tidal exchange. Therefore, no long-term changes in salinity above natural fluctuations are expected to occur as a result of the channel relocation with beach nourishment alternative.

Cumulative Effects. Salinity levels are not anticipated to change as a result of this project and therefore, no cumulative impacts are expected to occur.

Compatibility with Project Objectives. This alternative is fully compatible with the project objectives.

5.9 AIR QUALITY

None of the alternatives would have an impact on air quality.

5.10 PUBLIC SAFETY

Alternative A – No Action

Direct and Indirect Impacts. The erosion of the inlet shoreline would threaten and eventually destroy 36 homes on the west end of Emerald Isle. In response to the threat, property owners would begin to take measures to demolish the threaten buildings and transport the construction debris to sanitary landfills. The activity associated with the demolition would expose workers to risk of injury comparable to similar construction activities. There is also a strong possibility that some hazardous material could fall into the inlet which could pose health threats to people recreating along the inlet. As the erosion undermines existing roads and exposes electrical lines, sanitary systems, and ruptures or requires the relocation and rerouting of the water supply system, the public would be exposed to increased risk of injury and/or infection.

Cumulative Effects. Demolition activities, road undermining, and exposure of utilities would continue as long as the inlet shoreline migrates to the east. The longer the situation exist the higher the risk of personal injury. Raw sewage leaking from exposed septic tanks and the rupture or relocation of the water supply system would increase the risk of disease and infection.

Compatibility with Project Objectives. Project objectives do not directly address public safety. However, the exposure of utilities, particularly sanitary sewer systems, and potable water supplies would greatly compromise public health and safety.

Alternative B – Without Project – Relocate Homes

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Direct and Indirect Impacts. The erosion of the inlet shoreline would threaten 36 homes on the west end of Emerald Isle. In response to the threat, property owners would begin to take measures to move the threatened structure to a new location within the town limits of Emerald Isle. The construction activity associated with the structure relocation could expose workers to risks of injury. As the erosion undermines existing roads and exposes electrical lines, sanitary systems, and ruptures or requires the relocation and rerouting of the water supply system, the public would be exposed to increased risk of injury and/or infection.

Cumulative Effects. Demolition activities, road undermining, and exposure of utilities would continue as long as the inlet shoreline migrates to the east. The longer the situation exist the higher the risk of personal injury. Raw sewage leaking from exposed septic tanks and the rupture or relocation of the water supply system would increase the risk of disease and infection.

Compatibility with Project Objectives. Project objectives do not directly address public safety. However, the exposure of utilities, particularly sanitary sewer systems, and potable water supplies would greatly compromise public health and safety.

Alternative C – Without Project - Sand Bag Revetments

Direct and Indirect Impacts. The use of sand bag revetments would allow the Town of Emerald Isle more time to respond to threats to the utilities which should reduce the risk of disease and infection from spilled raw sewage and exposure of the potable water supply system, however, the public would still need to boil water prior to use following each rerouting of the potable water supply system. If the shoreline continues to migrate to the east over 10 years, 23 homes would be impacted by the eastward migration of the inlet. While the sandbags would reduce the demolition activities, workers would still be exposed to personal injury risks.

While the public is suppose to stay off of the sand bag revetments, people walking around the inlet shoreline will be tempted to cross over or walk along the sand bags. The sand bags offer a very slippery surface, particularly when covered with algae or loose sand which greatly increases the risk of falling.

Cumulative Effects. Cumulative effects are expected to be similar to those described in the no action alternative with only a slight reduction in the magnitude of the risk of exposure to health and safety.

Compatibility with Project Objectives. Project objectives do not directly address public safety. However, the exposure of utilities, particularly sanitary sewer systems, and potable water supplies during the 10-year analysis period would greatly compromise public health and safety.

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Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. All of the safety and public health safety risks associated with the continued eastward migration of the inlet shoreline described under no action alternative would be eliminated.

Over time, as the ocean shoreline erodes in response to the new channel position, the degree of storm damage protection afforded ocean front property owners on the western 7,500 feet of Emerald Isle would decrease. However, the adjusted shoreline and remaining dune system would still provide adequate protection against damages that would be associated with a storm comparable to Hurricane Floyd of 1999 (see Appendix B).

Cumulative Effects. The general welfare of the property owners in the Pointe subdivision and visitors to the inlet shoreline would greatly improve over existing conditions. Sandbags would no longer be required to protect threatened homes and/or roads so the public would not be exposed to the risk of slipping or falling off of the sand bags.

Compatibility with Project Objectives. The habitat of the inlet area would be restored including the removal of the existing sand bags that pose a risk to people trying to walk around the Pointe shoreline. Septic tanks would no longer pose a risk of polluting the inlet waters when they are exposed and begin to leak.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. All of the safety and public health safety risks associated with the continued eastward migration of the inlet shoreline described under no action alternative would be eliminated.

Over time, as the ocean shoreline erodes in response to the new channel position, the degree of storm damage protection afforded ocean front property owners on the western 7,500 feet of Emerald Isle would decrease. However, the adjusted shoreline and remaining dune system would still provide adequate protection against damages that would be associated with a storm comparable to Hurricane Floyd of 1999 (see Appendix B). Also, the inclusion of the eastern 3,000 feet of the affected shoreline area in the Phase 3 beach nourishment project combined with the continued disposal of navigation maintenance material on the extreme west end of Emerald Isle will partially mitigate for the erosive impacts.

Cumulative Effects. The general welfare of the property owners in the Pointe subdivision and visitors to the inlet shoreline would greatly improve over existing conditions. Sandbags would no longer be required to protect threatened homes

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and/or roads so the public would not be exposed to the risk of slipping or falling off of the sand bags.

Compatibility with Project Objectives. The habitat of the inlet area would be restored including the removal of the existing sand bags that pose a risk to people trying to walk around the Pointe shoreline. Septic tanks would no longer pose a risk of polluting the inlet waters when they are exposed and begin to leak.

5.11 AESTHETIC RESOURCES

Alternatives A and B would have the same impacts on aesthetic resources as described below.

Direct and Indirect Impacts. Alternatives A and B would include regular channel maintenance and the use of offshore borrow areas to complete Phase 3 of the nourishment project. Presence of the dredging equipment in Bogue Inlet, as well as, at the offshore borrow site, will temporarily detract from the visual aesthetics of the area. The offshore sand color may be different from the sand color of the beach, and may detract from the aesthetic quality of the beach. This impact, however, would be short-term since the sediments will lighten due to the natural working by sunlight, rain, and wind with time.

Cumulative Effects. Alternatives A and B would allow the continuation of erosion on western Emerald Isle, resulting in the loss of existing structures in the Town of Emerald Isle. Loss of these structures would reduce the visual aesthetics of the area. The increase in beach area along the Phase 3 shoreline would result in an overall improved aesthetic quality for the nourished beach.

Compatibility with Project Objectives. Alternatives A and B do not support the project objectives by reducing the effects of erosion along the western shoreline of Emerald Isle. Construction of the Phase 3 beach nourishment project will occur using offshore borrow material that may contain higher concentrations of shell and shell hash compared to the native beach.

Alternative C – Without Project - Sand Bag Revetments

Direct and Indirect Impacts. The installation of sand bag revetments along roadways and homes would provide temporarily protection from erosion. However, the presence of sand bags will likely detract from the aesthetics of the surrounding area.

Cumulative Effects. Sandbags are expected to reduce erosion along the western edge of Emerald Isle; however, erosion will still occur after the permit periods are over and the sand bags have been removed. Erosion is expected continue, leading

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to the destruction of homes, roads and utilities, all of which will affect the aesthetics of the project area. At the end of the permit period threatened structures would be abandoned and would have to be demolished, which would further detract from the visual aesthetics of the Town. Cumulative effects for the nourished beach would be comparable to the cumulative effects of Alternatives A and B.

Compatibility with Project Objectives. The sand bag revetment alternative is not compatible with the project objectives as they relate to aesthetic resources.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. The aesthetics of the surrounding area of Emerald Isle will be temporarily impacted by the presence of the construction equipment in Bogue Inlet during dredging. After relocation of the channel and demobilization of the construction equipment and the removal of the temporary sandbag revetments, the quality of the aesthetic resources within the project area will improve.

Cumulative Effects. Relocation of the channel, construction of a sand dike, and filling of the existing channel will alter the erosion effects to the western shoreline of Emerald Isle. Thus, the channel relocation without beach nourishment alternative will preserve the aesthetic quality of the Town of Emerald Isle by preventing the destruction of homes along the Pointe subdivision. Since Phase 3 beach nourishment would involve the use of offshore borrow sites, the cumulative effects for the channel relocation without beach nourishment alternative should be similar to the cumulative effects of Alternatives A and B.

Compatibility with Project Objectives. This alternative supports the project objectives related to restoration of the aesthetic resources within the inlet complex, but does not provide for the restoration of the resources within the Phase 3 beach nourishment project area.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. Direct and indirect effects on aesthetic quality for the channel relocation with beach nourishment alternative should be similar to those for channel relocation without beach nourishment alternative except the existing sandbag revetment may remain in place for up to two years or until such time that the inlet shoreline recovers sufficiently to allow their removal. The use of sand from the inlet for beach nourishment will likely provide sediment that more closely matches that of the original beach sediment, and therefore, differences in sediment coloration and composition are not likely to occur.

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Cumulative Effects. Movement of the inlet channel and construction of a sand dike will slow erosion of the eastern shoreline of Bogue Inlet. Therefore, cumulative impacts to aesthetic quality as a result of channel relocation should be similar to those listed for channel relocation without beach nourishment alternative. The nourished beach will include the restoration of dune habitat that may also increase vegetative growth to the area. Thus, increased beach area and restoration of the natural shoreline would result in an overall improved aesthetic quality.

Compatibility with Project Objectives. This alternative is compatible with the project objectives.

5.12 RECREATION RESOURCES

Alternatives A, B, and C would have the same impacts on recreational resources as described below.

Direct and Indirect Impacts. The offshore borrow material that would be used to nourish Phase 3 of the permitted Emerald Isle beach nourishment project would probably contain a high concentration of shell and shell hash similar to the fill material placed on other sections of Bogue Banks. The shell and shell hash tends to accumulate in the area between mean low water and mean high water making walking across the area in bare feet uncomfortable and possibly dangerous due to the possibility of being cut by the sharp edges of the larger shell pieces. This appears to have been the biggest complaint from visitors using the newly nourished sections of Bogue Banks. While the impact does not appear to have been profound, as tourism during 2003 appeared to be strong, if the 2003 visitors experienced an unfavorable experience as a result of the shell, they could elect not to return to Bogue Banks in the future.

The continued erosion of the inlet shoreline would make it impossible to reestablish public access to the inlet shoreline to the same degree that existed in the past. Access from the ocean shoreline to the inlet would require negotiating a rather narrow beach in front of a vertical erosion scarp, in the case of Alternatives A and B, or around the sandbag revetments under Alternative C. In years past, when direct public access to the inlet shoreline was available at the Pointe, the Town of Emerald Isle maintained a public beach access at the end of Inlet Drive that included some parking spaces. The loss of this public beach access was of major concern to residents of all of Emerald Isle who enjoyed the scenic beauty of the inlet, walked along the inlet shoreline, participated in bird watching either individually or in groups, swam in protected waters along the sand spit, or fished in the inlet.

Cumulative Effects. The high shell content of the material used to nourish portions of Bogue Banks could result in future cancellations by visitors to the island. This

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would have a long lasting impact on the local economy, for even if the beaches eventually recover and return to more natural conditions, the unpleasant experience could take years to overcome before the affected parties are willing to try Bogue Banks again.

Compatibility with Project Objectives. Alternatives A, B, and C would not provide ideal fill material for completion of Phase 3 of the permitted Emerald Isle beach nourishment project. Public access to the inlet shoreline could not be restored to past conditions resulting in continuing negative impacts on the public's use of the inlet.

Alternative E – Channel Relocation without Beach Nourishment

Direct and Indirect Impacts. The impacts on recreational resources associated with the use of an offshore borrow area to nourish Phase 3 of the permitted Emerald Isle beach nourishment project would be the same as Alternatives A, B, and C. Public access to the inlet shoreline could be restored to past conditions allowing the public the opportunity to enjoy the resources in and around Bogue Inlet.

Cumulative Effects. Cumulative effects on visitors to Emerald Isle would be the same as Alternatives A, B, and C for the ocean shoreline. Access to the inlet would be maintained as long as the new channel maintains a position well west of the present shoreline.

Compatibility with Project Objectives. Visitors to the ocean shoreline within Phase 3 may not have the quality experience one would expect if the offshore material has a high shell content. However, the restoration of public access to the inlet shoreline would restore many of the recreational opportunities that residents and visitors to Emerald Isle had come to expect prior to the eastward migration of the inlet channel.

Alternative F – Channel Relocation with Beach Nourishment

Direct and Indirect Impacts. The use of the inlet channel material to nourish Phase 3 would create a wider recreational beach with qualities essentially the same as the existing beach. The impact on recreational activities associated with the inlet and inlet shoreline would be the same as Alternative E.

Cumulative Effects. The high quality beach fill along Phase 3 of the permitted Emerald Isle beach nourishment project would have a positive impact on visitors and would encourage their return in later years. Access to the inlet would also provide greater recreational opportunities than presently exists which should also enhance future visitations and repeat visitations.